A MULTI-FUNCTION POLE

BACKGROUND OF THE INVENTION

Field of the Invention

This invention relates to a structural, multi-function pole, and more particularly to a multi-function pole suitable for selectively mounting one or more fixtures.

Background Art

A typical street pole consists of a vertical shaft and an anchor bolt structure for connection the shaft to the ground. Accessories such as lights, traffic signals, arms, and pedestrian signs are attached using various conventional connection methods. The most common connection method is to weld a plate onto a portion of the exterior surface of the shaft and to bolt the selected accessory to the plate. This method requires that all details of a pole system be known before it is manufactured. This includes knowing exact orientation of signs, lights, banners, etc. that would be attached to a pole for the particular geographic location. Another connection method is to wrap an external strap around the vertical shaft and connect the strap to the accessory. While these two connection methods are used today throughout the world, it is not an optimum solution as these methods lead to a proliferation of multiple poles on corners and throughout most cities.

The multi-function poles described herein address these needs by permitting the addition of multiple fixtures after initial manufacture without the need for external strapping. The pole is built based on the currently known needs and will permit the addition of future technology as time progresses. The multi-function pole described herein is intended to reduce the need for extra poles to support individual functions and accessories as well as reduce clutter on city streets.

Summary of the Invention

The multi-function pole has a base assembly and an upper assembly. The upper assembly includes a beam and an enclosure structure that is positioned in overlying registration with at least a portion of the beam. The enclosure structure is constructed and arranged for releasable connection to the portion of the beam. In one example, a portion of one end of the base assembly is adapted to be conventionally mounted onto a ground

surface and a portion of the other end of the base assembly is adapted to be fixedly connected to a portion of the beam of the upper assembly. The enclosure structure defines at least one track that is constructed and arranged for attaching a desired fixture thereto. In one example, an arm, which may have one of more fixtures mounted thereto, can be mounted to the substantially vertical pole by the use of a collar assembly.

Brief Description of the Figures

These and other features of the preferred embodiments of the invention will become more apparent in the following detailed description in which reference is made to the appended drawings wherein:

Fig. 1 is a side elevational view of a multi-function pole of the present invention.

Fig. 2 is a cross-section view of a multi-function pole of Fig. 1 taken along line 2-2.

Fig. 3 is a cross-sectional view of a portion of a base assembly of the multi-function pole of Fig. 2 taken along line 3-3.

Figs. 4-6 are cross-sectional views of portions of the upper assembly of the multi-function pole of Fig. 2 taken along respective lines 4-4, 5-5, and 6-6.

Fig. 7 is a partial side elevation view of the multi-function pole showing a portion of a horizontal arm mounted to the pole by a collar assembly.

Figs. 8-10 are cross-sectional views of Fig. 7 taken across respective lines 8-8, 9-9 and 10-10.

Fig. 11 is a partial side elevation view of the multi-function pole showing a portion of a horizontal arm having traffic signals and a message board connected thereto being mounted to the pole by a collar assembly.

Fig. 12 is a cross-sectional view of the horizontal arm of Fig. 11 taken across line 12-12.

Figure 13 is a cross-sectional view of the horizontal arm of Fig. 11 taken across line 13-13.

Fig. 14 is a partial side elevation view of an alternate embodiment of the horizontal arm and multi-function pole of Fig. 11.

Fig. 15 is a cross-sectional view of the horizontal arm of Fig. 14 taken across line 15-15.

Figure 16 is a cross-sectional view of the horizontal arm of Fig. 14 taken across line 16-16.

Fig. 17 is a partial side elevation view of the multi-function pole showing a portion of a horizontal arm mounted to the pole by an alternative embodiment of a collar assembly.

Fig. 18 is a cross-sectional view of the horizontal arm of Fig. 17 taken across line 18-18.

Fig. 19a is a cross-sectional view of the horizontal arm of Fig. 17 taken across line 19a-19a.

Fig. 19b is a cross-sectional view of the horizontal arm of Fig. 17 taken across line 19b-19b.

Fig. 20 is a partial side elevation view of the multi-function pole showing multiple fixtures mounted to it.

Fig. 21 is a cross-sectional view of an upper assembly of the multi-function pole of Fig. 20 taken across line 21-21 showing an exemplary means for connecting the fixture to the upper assembly.

Figs. 22a and 22b are partial cross-sectional views of an exemplary base mount.

Figs. 23 and 24 are perspective views of a collar mount.

Fig. 25 is a partial cross-section view of a pair of collar mounts connected to an enclosure structure and a beam of an upper assembly of the pole of the present invention.

Detailed Description of the Invention

The present invention is more particularly described in the following examples that are intended as illustrative only, since numerous modifications and variations therein will be apparent to those skilled in the art. Thus, the embodiments of this invention described and illustrated herein are not intended to be exhaustive or to limit the invention to the precise form disclosed. They are chosen to describe or to best explain the principles of the invention and its application and practical use to thereby enable others skilled in the art to best utilize the invention. As used in the specification and in the claims, "a," "an," and "the" can mean one or more, depending upon the context in which it is used. The preferred embodiment is now described with reference to the figures, in which like numbers indicate like parts throughout the figures and views.

Referring now to figures 1-6, one embodiment of the multi-function pole 10 described herein is depicted. The multi-function pole has an upper assembly 20 and a connected base assembly 30. The base assembly includes a longitudinally extending cylindrical housing 32 defining an interior volume. The base assembly may also include a cover 34 that may be selectively and removably connected to a portion of the exterior surface of the housing. In one example, the cover may be positioned in substantial overlying registration with the portion of the exterior surface of the housing and is sized and shaped for complementary fit with the portion of the exterior housing. The cover may extend over substantially the entire exterior surface of the housing. In an alternative example, a portion of the exterior surface of the housing proximate the bottom end of the housing is left exposed. In one embodiment, the cover may be a unitary piece of material. In another embodiment, the cover has a plurality of longitudinally extending cover members that are sized and shaped for complementary fit to a portion of the exterior surface of the housing. In one example, in use, the plurality of cover members is fastened to the exterior surface of the housing to form the contiguous substantially cylindrical cover, as shown. The cover members may be fastened to the housing using conventional fasteners. The components of the base assembly can be manufactured from a variety of materials such as, for example, steel, cast iron, aluminum, fiberglass, stainless steel, or composite. The selection of the material can depend upon the number and types of fixtures that are attached to the pole, environmental conditions, the ease of installation, and the like. The diameter and length of the base assembly are predetermined and depend upon the end-use of the pole. The cover can protect the housing core from corrosion and deterioration from prolonged exposure to adverse weather conditions and the like.

In one embodiment, the housing of the base assembly can contain at least one access port 36 that permits access to the interior volume of the housing. The size of the access port can vary depending upon the end-use of the pole and the size of the housing. In one example, an access panel can be secured to the housing to cover the access port. Alternatively, the cover members forming the cover can cover the access port when they are fastened to the housing. As one skilled in the art will appreciate, electrical wiring and cables from remote power and control sources may be routed through conventional ground conduits through the bottom end of the housing and into the interior volume of the

housing. In use, the access ports provide easy access to wiring and cables within the interior volume.

In another embodiment, a large mounting plate 38 is connected to a portion of the interior surface of the housing. Preferably, the mounting plate is positioned within the interior volume of the housing to substantially face toward the access port(s) and to span the interior volume of the housing so that the mounting plate can provide additional structural strength to the housing. The mounting plate can also provide a surface for mounting new control gear necessary for the fixtures that are ultimately attached to the pole once the pole has been installed. Examples of control gear include, but are not limited to, electrical boxes, junction boxes, light ballast, and switches.

The upper assembly of the pole has a beam 22 and an enclosure structure 24 that is positioned in overlying registration with at least a portion of the beam. The longitudinally extending beam is hollow and may have a circular or a non-circular cross-section exterior shape, such as, for example, an octagonal, hexagonal, or square shape. Apertures or ports may be defined in the beam to allow for communication with the interior of the beam. These apertures or ports may be pre-fit at a manufacturing facility or may be formed as desired at the construction site. A portion of one end of the beam is adapted to be fixedly connected to a portion of one end of the base assembly such that the beam and housing extend substantially co-axial to each other.

The hollow beam generally permits wire and cables to be routed through it. Any of the materials described above for the manufacture of the housing may be used to produce the beam. The housing of the base assembly and the beam of the upper assembly may be composed of the same material or different material. In one embodiment, the housing and the beam are composed of steel. The length of the beam, which can be predetermined, can also vary depending upon the end use of the pole and the number of fixtures attached to it.

In one example, a plurality of mounting plates 26 are positioned within the interior volume of the housing proximate the upper end of the housing. Each mounting plate may define an opening that is sized and shaped to complement the exterior surface shape of the beam. In the exemplified embodiment, a first mounting plate is connected to the upper end of the housing and a second mounting plate is connected to the interior

surface of the housing a predetermined distance from the upper end of the housing. In use, the beam extends through and is connected to the first mounting plate and the proximal end of the beam is connected to the second mounting plate. Generally, the connected beam of the upper assembly and the housing of the base assembly provide the load-carrying capability of the pole. As one will appreciate, the length to which the beam is inserted into the interior volume of the housing of the base assembly can be predetermined and will depend upon the end-use of the pole.

The enclosure structure can be constructed and arranged for releasable connection to the portion of the beam. The enclosure structure defines at least one track 28 extending longitudinally along at least a portion of the enclosure in the exterior surface of the enclosure structure that is constructed and arranged for attaching a desired fixture and/or mounting arm thereto. The enclosure structure has an interior surface that is sized and shaped for overlying registration with the exterior surface of the beam. Portions of the interior surface of the enclosure structure may contact portions of the exterior surface of the beam when connected. The enclosure structure may be extruded and produced from various materials including, but not limited to, aluminum, aluminum alloy, and the like. In the illustrated example, the enclosure structure has an external cross-sectional shape that is primarily circular, although other cross-sectional shapes can be utilized.

Each track of the enclosure structure is spaced from an adjacent track about the periphery of the exterior surface. In one embodiment, each track is 30 spaced from an adjacent track substantially about 90 degrees. The enclosure structure is positioned in overlying registration with the portion of the beam and is releasably attached to the beam. In one example, the enclosure structure is connected to the beam using a combination of set screws, spacers, fixing nuts, and a shear bolt extending through the beam. The fixing nut 21 is positioned within the track. The setscrew 23 is threaded through the fixing nut and passes through a hole in the extruded cover and contacts exterior surface of the beam. The shear bolt 25 is inserted through co-axial holes that traverse the beam, the enclosure structure, fixing nuts, and spacers 27. In this embodiment, the spacers are used to create a solid compressive joint directly between enclosure structure and the beam. This shear bolt may be utilized to hold portions of the base assembly and the upper assembly together

during shipment and initial pole installation. Other connection means may be utilized as desired.

The longitudinal length of the beam relative to that of the enclosure structure may vary depending upon the number and type of fixtures that are attached to the pole. For example, the beam may extend substantially to the end of the attached enclosure structure, or, as exemplified, may extend only partially to the end of the attached enclosure structure.

The pole may also include a transition member 31 that may be connected to the upper end of the housing of the base assembly. The transition member defines an opening constructed and arranged so that the beam can pass therethrough. In use, the bottom edge of the enclosure structure may rest on an upper portion of the transition member. Further, the upper edge of the cover of the base assembly is positioned in contact with a lower portion of the transition member. In one example, the lower portion of the transition member defines a peripheral extending lip that extends beyond the exterior surface of the cover of the base assembly. The lip can aid in preventing water intrusion into the interior volume of the housing of the base assembly, which ultimately prolongs the life of the pole.

Referring now to figures 7-21 and 23-25, mounting arm embodiments that are releasably attached to the enclosure structure of the upper assembly may be appropriately scaled to support the amount of load that is to be attached to portion(s) of the arm. One or more fixtures can be attached to the pole or mounting arms described herein. Examples of fixtures include, but are not limited to, traffic signals, variable message signs, pedestrian signals, banner Arms, street signs, bicycle racks, illuminated banners, and the like.

In one embodiment, referring now to figures 7-16 and 23-25, a mounting arm 40 is shown attached to a portion of the pole 10. In this example, the arm is scaled so that it can support traffic signals or variable message signs over roadways. These arms typically extend 15 feet to 40 feet in length and may vary in length based on the specific installation.

Referring to the example shown in figure 8, an embodiment of a collar assembly 50 is used to releasably attach the mounting arm to the upper assembly of the pole. In the embodiment illustrated, the collar assembly has a collar housing 52 and a pair of collar

mounts 64. The collar housing has a first collar member 54 and an opposed second collar member 56. The first collar member has a male protrusion 58 extending from about a mid-point of the interior surface of the first collar member that is sized and shaped for operative receipt within a portion of one track of the enclosure structure. The second collar member has a hollow male protrusion 59 extending from about a mid-point of the interior surface of the second collar member that is sized and shaped for operative receipt within one track of the enclosure structure. Further, the second collar member has a substantially hollow tube 60 extending from the exterior surface of the second collar member. The hollow tube has at least one rigid pin 62 that bisects the interior of the tube to enhance the structural rigidity of the tube. The respective ends of the at least one pin may extend to the exterior surface of the tube and may be drilled and tapped to receive a conventional fastener. In one example, the tube of the second collar member is substantially co-axial with the hollow male protrusion of the second collar member. In an alternative example, the tube of the second collar member extends at an obtuse angle with respect to the male protrusion of the second collar member.

Each of the first and second collar members have a plurality of bores that extend from a portion of the exterior surface of the respective collar members to each of the side edges of the respective collar members. When the first and second collar members are operatively positioned about the upper assembly, each bore in the first collar member is opposed by a co-axial bore in the second collar member.

Referring to figures 23-25, each of the collar mounts 64 has a center portion 70, and two respective side portions 72 extending from the center portion. The center portion defines a bore 74 that extends from the top surface of the center portion to the lower surface of the center portion. The bore is constructed and arranged for receipt of a portion of a fastener, such as, for example, a conventional nut and bolt assembly. The side portions of the collar mount have a base 76 that is constructed and arranged for operative receipt within the track of the enclosure structure and an outwardly extending flange 77 that extends substantially normal to the base. The flange defines an opening 78 that extends through the flange and is constructed and arranged for receipt of a portion of a fastener.

In use, a portion of the exterior surface proximate two opposing tracks of the enclosure structure is removed so that the central portion of the collar mount and the side portions of the collar mount can be operatively inserted within the respective track. A bolt is passed through the bores of the opposing pair of collar mounts and the complementary apertures in the enclosure structure and beam of the upper assembly. In one example, conventional nuts are mounted on the ends of the bolt to releasably secure the collar mounts relative to the beam of the pole.

Subsequently, the first collar member is positioned onto a portion of the exterior surface of the enclosure structure so that portions of the male protrusion extends into and contacts portions of one track of the enclosure structure. The second collar member is positioned onto a portion of the exterior surface of the enclosure structure in opposition to the first collar member. The hollow male protrusion extends into a complementary opening in a track of the enclosure structure so that portions of the male protrusion contacts portion of the track. The hollow male protrusion is in operative communication with an aperture in the track and the bore so that cables may be passed from the interior of the beam of the upper assembly through the tube of the second collar member. When the first and second collar members are operatively positioned about the upper assembly in this manner, each bore in the first collar member is opposed by the co-axial bore in the second collar member with one opening 78 in the flange of the collar mount positioned therebetween.

Fasteners, such as, for example, a conventional nut and bolt assembly, are operatively positioned within the respective bores of the first and second collar members and the interposed opening in the flange of the collar mount. When the fasteners are secured, portions of the side edges of the first and second are releasably connected to portions of the flanges of the respective collar mounts. In one embodiment, the upper and lower edges of the first and second collar members are sized and shaped to complementarily fit portions of the exterior surface of the enclosure structure. Thus, by being fixed to the collar mounts, the first and second collar members are fixed relative to the beam of the upper assembly of the pole. The respective male protrusions of the first and second collar members positioned within the tracks of the enclosure structure also aid

in preventing the rotation of the assembled collar assembly about the upper assembly of the pole.

In one example, illustrated in figures 7 and 8, a hollow mounting arm 40 is connected to a portion of the exterior surface of the tube of the second collar member. Fasteners may be mounted to the respective drilled and tapped ends of the pins of the tube. In one example, a portion of the end of the mounting arm is positioned in overlying registration with a predetermined length of the exterior surface of the tube of the second collar member.

Figures 11-13 depict an alternative embodiment of the mounting arm that can be secured to the collar assembly. In this embodiment, at least a portion of the tube 60 of the second collar member has a non-circular cross-sectional exterior shape, such as, for example, an octagonal, hexagonal, or square shape. In this embodiment, a proximal end of the mounting arm 82 is constructed and arranged for operative receipt and releasable mounting onto portions of the non-circular cross-sectional shaped tube 60 proximate the end of the tube.

Similar to the enclosure structure of the upper housing of the pole, the exterior surface of the mounting arm 82 defines at least one track extending longitudinally along at least a portion of the enclosure that is constructed and arranged for attaching fixtures, for example, traffic signals or signage, thereto. The mounting arm 82 has an interior surface that is sized and shaped for overlying registration with portions of the exterior surface of the tube such that portions of the interior surface of the mounting arm 82 may contact portions of the exterior surface of the tube 60 when connected. The mounting arm 82, in one example, may be extruded and produced from the materials that form the enclosure structure of the upper assembly of the pole.

In one example, a nut 84, can be inserted within the track of the mounting arm 82 and a complementary bolt can be used to fasten a traffic signal or signage to the exterior surface of the cladding structure. In use, the bolt operatively engages a conventional nut that is positioned within the track. In one example, the nut is rectangular in shape and can be rotated into proper position as the bolt is being tightened. In this example, the shape and fit of the nut and the track of the mounting arm 82 force the nut to rotate, for example, about approximately 90 degrees, into a desired orientation within the track. The

fastener and nut create a tight compressive joint between the mounting arm and the suspended fixture.

Complementary apertures defined in the cladding structure and the underling strut allow for necessary cabling to be in operative communication with the attached accessories and the interior of the mounting pole.

Referring to figure 14, a post top mounting method can be used to attach a mounting arm to the pole. An alternative embodiment of a collar assembly is mounted onto the distal end of the upper assembly. In this embodiment, the beam may extend substantially to the distal end of the enclosure structure. It may be connected to the enclosure structure and the beam using various methods, such as, for example, conventional bolts, nuts, fixing nuts, and the like.

Referring to figures 17-19b, an alternative embodiment of the collar assembly is illustrated. This embodiment is suitable for support of lighter mounting arms, such as arms that support lights and/or signage over roadways, pedestrian walkways, or other areas needing light. Typically, lighter arms can extend from a few inches to several feet in length.

In this embodiment, the collar assembly includes a first collar member and a second collar member. The first collar member has a male protrusion extending from about a mid-point of the interior surface of the first collar member that is sized and shaped for operative receipt within a portion of one track of the enclosure structure. The second collar member has a hollow male protrusion extending from about a mid-point of the interior surface of the second collar member that is sized and shaped for operative receipt within one track of the enclosure structure and through a formed opening within the enclosure. Further, the second collar member has a substantially hollow tube extending from the exterior surface of the second collar member. The hollow tube has at least one rigid pin bisecting the interior of the tube to enhance the structural rigidity of the tube. The respective ends of the pin may extend to the exterior surface of the tube and may be drilled and tapped to receive a conventional fastener (i.e., for securing the mounting arm to the exterior surface of the tube). In one example, the tube of the second collar member is substantially co-axial with the hollow male protrusion of the second

collar member. In an alternative example, the tube of the second collar member extends at an obtuse angle with respect to the male protrusion of the second collar member.

Each of the first and second collar members have a plurality of bores that extend from a portion of the exterior surface of the respective collar members to each of the side edges of the respective collar members. When the first and second collar members are operatively positioned about the upper assembly, each bore in the first collar member is opposed by a co-axial bore in the second collar member.

In use, the first collar member is positioned onto a portion of the exterior surface of the enclosure structure so that portions of the male protrusion extends into and contacts portions of one track of the enclosure structure. The second collar member is positioned onto a portion of the exterior surface of the enclosure structure in opposition to the first collar member. The hollow male protrusion extends into the formed opening in the track of the enclosure structure so that portions of the hollow male protrusion contact at least a portion of the track. The hollow male protrusion is in operative communication with an aperture in the track and the bore so that cables may be passed from the interior of the beam of the upper assembly through the tube of the second collar member.

When the first and second collar members are operatively positioned about the upper assembly in this manner, each bore in the first collar member is opposed by the co-axial bore in the second collar member. Fasteners, such as, for example, a conventional nut and bolt assembly, are operatively positioned within the respective bores of the first and second collar members. When the fasteners are secured, portions of the side edges of the first and second are drawn toward each other to form an interference fit between portions of the exterior surface of the enclosure structure and portions of the upper and lower edges of the respective first and second collar members. Thus, the respective male protrusions of the first and second collar members positioned within the tracks of the enclosure structure aid in securing the collar assembly relative to the upper assembly of the pole. Also, the interference fit between the hollow male protrusion of the second collar member and the formed opening in the track prevents vertical and rotational movement of the second collar member of the collar assembly relative to the enclosure structure.

In the illustrated example, a hollow mounting arm is connected to a portion of the exterior surface of the tube of the second collar member. Fasteners may be mounted to the respective drilled and tapped ends of the pins of the tube. In this example, a portion of the end of the mounting arm may be positioned in overlying registration with a predetermined length of the exterior surface of the tube of the second collar member.

In an alternative embodiment shown in figures 20-21, fixtures and or signage, such as, for example, pedestrian signals, banner arms, street signs, bicycle racks, illuminated banners, and the like, may be mounted to an armature assembly. The armature assembly is releasably connected to the tracks in the exterior surface of the enclosure structure of the pole. In this embodiment, the armature assembly includes a rod and a mounting base. The rod extends from a top surface of the mounting base. In one example, a portion of the bottom surface of the mounting base may have a male protrusion (not shown) extending therefrom that is constructed and arranged for operative receipt within the track to aid in preventing rotation of the armature assembly. The ends of the mounting base define openings extending between the top and bottom surface that are sized and shaped for receipt of a fastener, such as a conventional bolt. In use, the fasteners 100 extend through the openings in the mounting base 102 and into a conventional nut 104 that is positioned within the track. In one example, the nut is rectangular in shape and can be rotated into proper position as the bolt is being tightened. In this example, the shape and fit of the nut and the track of the enclosure structure force the nut to rotate approximately 90 degrees into a desired orientation within the track. The fastener and nut create a tight compressive joint between the armature assembly and the upper housing of the pole.

In general, the poles described herein are pre-manufactured then installed at a particular site. Typically, the poles are installed on sidewalks or roads. To install the pole, a conventional mounting plate is conventionally installed onto a desired surface. Referring to Figures 22a and 22b, an exemplary mounting plate 90 having a mounting aperture 91 is first anchored to concrete footings 92 by a plurality of anchor bolts 93. Any wiring for the internal area of the pole may be installed before raising and mounting the pole.

Although several embodiments of the invention have been disclosed in the foregoing specification, it is understood by those skilled in the art that many modifications and other embodiments in the invention will come to mind to which the invention pertains, having the benefit of the teaching presented in the foregoing description and the associated drawings. It is thus understood that the invention is not limited to the specific embodiments disclosed hereinabove, and that many modifications and other embodiments are intended to be included within the scope of the invention. Moreover, although specific terms are employed herein, they are used only in a generic and descriptive sense, and not for the purposes of limiting the described invention.